WACCAMAW AREAWIDE

WATER QUALITY MANAGEMENT PLAN

1986 UPDATE

Prepared by Waccamaw Regional Planning and Development Council

June 1986

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Major funding was provided by the South Carolina Coastal Council from resources made available by the National Oceanic and Atmospheric Agency. Project supervision and technical assistance was provided by the South Carolina Department of Health and Environmental Control.

P R E F A C E

This plan update consists of three parts, done at different times, and consolidated herewith for public participation and approval purposes by the several agencies involved. Early funding for the first two parts was provided by the Environmental Protection Agency. The third part, which emphasizes storm runoff impacts on water quality in specified rapid growth areas, was supervised by the South Carolina Department of Health and Environmental Control (DHEC) in accordance with a contract with the South Carolina Coastal Council. This plan update was produced by the Waccamaw Regional Planning and Development Council under a sub-contract with DHEC.

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Prepared by Waccamaw Regional Planning
And Development Council

JUNE 1986

SUMMARY

208 UPDATE III

The 208 Update III concentrates on the nonpoint runoff impact issue. As part of this update a Methodology to assess Nonpoint Pollution Impacts on Water Quality was developed. This was based on a Nonpoint Pollution Literature Survey.

The Waccamaw Region does not have a model capable of simulating NPS impacts on water quality as do the two other Coastal COGS. The Waccamaw Region's waters do not meet the Standard of 5 mg/l DO even without any local dischargers or local nonpoint inputs. This is the natural system. The fact that these local waters don't meet the standard means that the assimilative capacity of the local rivers is low and any potential nonpoint pollution could reduce the assimilative capacity more. All existing Waccamaw Grand Strand area dischargers are at their assimilative capacities now. There is no way with existing tools, to predict the impact of NPS on water quality, however, the newly installed USGS water quality monitors will give a much better picture if they can be operated for another year.

A new analysis of NPS loadings contributed by present and future development was conducted for this plan and the conclusions of this analysis were that BOD loadings from an intense summer storm will increase about 60% by 2005 if no controls are implemented to control the runoff. There is no way to translate this to water quality impacts. The volume of runoff increases up to 1000% in this type storm and while the BOD loading may increase, the actual concentrations may decline due to the greater volume of water. Water quality problems are sure to arise in waters where stormwater is the majority of flow or is poorly diluted. The primary issue is duration and intensity of these impacts.

As a result of assessing point source allocations, NPS loadings and potential and existing water quality problems, three River segments in this Region were

designated severe potential NPS impairment with the potential for waste load allocation impacts. The primary area of concern was the ICWW from Socastee to NMB where MB and NMB get their drinking water and there is extensive growth expected with no NPS controls since this area is in Horry County. The other areas of concern are the Waccamaw River from Conway to ICWW where there are two dischargers and expansive growth is expected. The third area from above Wachesaw to 'C' Plant receives the greatest point source loadings and any decrease in assimilative capacity of this segment would be extremely costly to the dischargers.

As a result of these significant actual and potential impacts a "Wasteload Allocation and NPS Coordination Strategy" was developed. This strategy outlines a proposal to coordinate an evaluation and implementation plan between the Coastal Council, DHEC, and Waccamaw 208 staff.

The primary NPS impact along the Grand Strand is the bacterial contamination of shellfishing areas. All Grand Strand shellfish areas are closed at least conditionally and most are prohibited to shellfishing all the time. Management of runoff to shellfishing areas is a documented problem and must be addressed strongly and directly.

Management Agencies: The Grand Strand Water and Sewer Authority is recommended for designation to replace the Horry County and Sewer Authority. The West Horry 201 is prepared for amendment to provide for Innovative and Alternative Sewer Systems with land application of effluent for the Longs and Bucksport communities as outlined in the Wastewater Facilities Plan for these communities.

UPDATE III

WACCAMAW 208 AREAWIDE WATER QUALITY MANAGEMENT PLAN

WACCAMAW REGIONAL PLANNING
AND DEVELOPMENT COUNCIL

JUNE 1986

Nonpoint Source Impacts

The Waccamaw 208 Areawide Water Quality Managment Plan (1978) has previously identified stormwater runoff as a pollution concern particularly based on the work done through the Nationwide Urban Runoff Program (NURP). The primary focus of the Waccamaw NURP was bacteriological impacts of stormwater on beaches. This information also has implications for runoff to shellfishing areas. The initial 208 Plan completed and calibrated a mathematical model of the Grand Strand area from Winyah Bay to Little River including the Pee Dee and Waccamaw Rivers. This model, however, is basically a "steady state" model not capable of dynamic changes such as stormwater inputs. The 1978 208 analysis of nonpoint pollution (Appendix 6 and 7) only considered the annual nonpoint loadings contributed by large sub-basin areas. While these BOD loadings were predicted to increase by 35% there was no analysis of the possible water quality impacts of these increased NPS loadings.

All wastewater dischargers in the rapid growth areas delineated by the attached map discharge to waters which do not meet the presently defined water quality standard of 5.0 mg/l dissolved oxygen (D.O.). The fact that the Waccamaw Region's waters do not meet the defined standard is shown by an analysis of DHEC primary and secondary ambient monitoring stations along with special intensive surveys conducted in the area, and these low D.O. levels are also predicted by the 208's well-documented Waccamaw Intracoastal Waterway Model. Previous to the newly adopted DHEC standards dischargers were allowed to reduce the D.O. to 4 mg/l D.O., now new dischargers to these waters are required to adhere to the "0.1 mg/l D.O. rule." This rule in the water quality standards allows discharger in waters which do not naturally meet the standard of 5 mg/l D.O. to

bring the ambient background D.O. level down no more than 0.1 mg/l of D.O. This new standard represents a significant change from previous requirements. How this might affect increased or new wasteload requests is not clear and should be addressed in a comprehensive Regional Wasteload Strategy so that all Regional dischargers can have a clear view of wasteload requirements.

A complication in any long-term water quality assessment policy is the possible NPS impacts from areas of uncontrolled development. The dischargers located in the rapid growth areas discharge to waters which also receive stormwater runoff from the developments they are designed to serve. Another factor in any assessment is that some dischargers which have stormwater controls in their area discharge to waters which may be already impacted by runoff from areas outside their jurisdiction. The role of the local 208 agency according to the 1986 Memorandum of Agreement is to balance the point source assimilative capacity allocations against the possible NPS impacts that the area may be having on water quality. It will, however, not be possible to accurately assess this factor of NPS impacts until a more detailed analysis of water quality impacts is understood.

In order to better understand the possible NPS impacts on overall water quality in the Waccamaw Region, an analysis was conducted to assess the type of loadings expected from future development.

The Waccamaw 208's original studies and resulting 1978 plan evaluated the runoff of three areas of different land uses. From this information a simplified desk top technique was developed to project the impacts of land-use changes on runoff volume and pollutant concentration. The S.T.O.R.M. model was then utilized to develop runoff curves for varying SCS curve numbers and varying storm return frequencies. The calibrated S.T.O.R.M. model was also used to estimate changes in pollutant loadings from changes in land use. The loading data was used to generate

annual pollutant loads and these loads were then predicted based upon future land use changes predicted to occur in each drainage areas. The basins were then ranked according to pollution potential.

While this ranking of NPS potential based upon annual pollutant loadings is helpful to understanding the long-term increases of pollutant loading in the region this does not help in predicting any water quality impacts of these changes. There is no discussion of the magnitude of these locally generated loads as compared to loads entering the region, nor is there any combination of NPS outputs with the water quality simulation model. There was also no attempt made to predict impacts on water quality or Waste Load Allocations. The Waccamaw ICWW model is not capable of simulating drynamic imputs such as stormwater making it difficult to predict any direct water quality impacts of non point sources without a new sophisticated and costly model.

Based upon an evaluation of existing conditions in the Waccamaw Region the available assimilative capacity has been allocated to almost all dischargers in the Grand Strand area and those not yet at assimilative capacity are expected to reach that capacity with their future projected increases.

A listing of discharges in the growth area and the remaining assimilative capacity follows:

City of Conway	-	Unknown
GSW&SA Central	-	0 Remaining
GSW&SA and MB City	-	0 Remaining
GSW&SA 'A'	-	0 Remaining
City of NMB	-	0 Remaining
GSW&SA 'C'	-	0 Remaining
City of Georgetown & I.P.	-	0 Remaining

With the exception of Grand Strand's Central Plant all the assimilative capacities are allocated for low flow at 30Q10 or 7Q10 flow regime. The Central facility's allocation was based on hydrograph related loadings with essentially no loadings permitted at low flows but the more flow in the river the more waste loading allowed. The water quality evaluation for this facility was also based on the "new" standard of allowing 0.1mg/l D.O. deficit in waters not meeting standards of 5mg/l. The Georgetown County 'C' Plant and the combined GSW&SA and MB discharge are based upon the 1978 Grand Strand EIS and the 208 model which were completed at the same time. The target D.O. for these allocations was 4 mg/l D.O. How the change in standards and policy may affect future permit reissuance is unclear. Another potential problem is that with the assimilative capacity of streams completely allocated to point sources there is a potential for nonpoint sources of pollution to affect these allocations. As described in the Methodology and Literature section it is not possible, according to DHEC, to predict the impact of NPS on low flow conditions without a dynamic model. There are too many variables to isolate or predict impacts. As rainfall events occur, the flows change which change reaction rates as well as other factors. The recently installed USGS continuous monitoring stations identified on the monitoring station map overlay is providing information on the D.O., PH, conductivity, temperature, and stage (flow) throughout the
Waccamaw/Pee Dee system on the Grand Strand in 15 minute intervals. This is the first time these type stations have been located in a coordinated manner to address Regional water quality issues. The information from these stations will be invaluable to understanding the water quality changes occuring with time. These station will be coordinated with rainfall data and stream flow data. With the type of decisions being made about assimilative capacity limits and increasing wastewater flows and new facilities this data will be invaluable to understanding

and modifying model conditions and assessing hydrograph release alternatives. These conditions will be essential to future planning for long term waste disposal options for dischargers.

Some evaluation of water quality in the Waccamaw Region and some assumptions about NPS loadings are important to understanding the Waccamaw system's responses. An analysis of rainfall events based upon BCD and Lowcountry STORM models and rainfall data provided by Mr. Purvis at Water Resources Commission lead to a conclusion (verified by John Chigges at DHEC) that a typical maximum summer storm event probably would provide about 10% the annual BOD loading. The loadings were generated by the STORM model which was calibrated for the Waccamaw Region (208 Appendix 7 in the 1978 plan). The drainage basins were modified to better assess future land use changes and keep the calculations more accurate. Most of the drainage areas were reduced to 10,000-20,000 acres (figure 1).

Once the basins were delineated then the land uses for 1985 and 2005 were developed for those areas. The land use categories are the same as those developed in Appendix 7. Once the curve numbers were developed for each area, then a series of storm return events were selected for evaluation: 12 Hour 10 Year, 24 Hour 5 Year, 12 Hour 1 Year, 6 Hour 10 Year, 6 Hour 5 Year, 6 Hour, 1 Year. These events were then calculated for inches of runoff by curve number as presented in the (Appendix 7). A new series of graphs was developed for each storm event since the previous study only generated the runoff for curve numbers 30,40,50,60,70,80, 90, and 100 and most of the curve numbers for the areas fall between these. Once this is accomplished we now have the ability to calculate the depth of runoff for every curve number and each of the return events. By multiplying the depth of runoff for a storm by the area then the total volume of runoff can be calculated. The BODs loading can be estimated from Figure 39

(Appendix 7) where the annual BOD loading in pounds per acre per year is estimated based upon curve number. A series of tables was developed to display this information (figure 2). Next, the most likely summer storms were selected. The runoff for present and future land uses were calcualted for each study area.

The greatest percentage of increases before and after development in runoff were shown by the more frequent short-duration storms (12 Hour 1 Year) as compared to the less frequent but higher intensity greater volume events (24 Hour 10 years). The runoff increases between the small events is great because the rainfall in a small rain is almost completely abstracted, producing very little runoff, but a small increase beyond this initially absorbed amount almost completely runs off. As an area's curve number increases with development then the amount of water required to saturate the area is significantly reduced and more water runs off the same storm. Thus, we see volume increases of 100-200% with the larger storms, but we see increases of 700-1000% with the smaller storms. A 100% increase in a large storm may, of course, be a much larger volume than a 1000% increase for a smaller storm. If the assumption that 10% of the runoff loading occurs during one of these events then we note that the increase in BOD loading due to changed land use from present to 2005 is about 60%. It is interesting to note, however, that the concentration of the runoff BOD diluted by the runoff varies significantly. The concentration of BOD in runoff after development acturally decreases. The loading increases, but the increased volume dilutes the runoff more. Whether the increased loadings are offset by the increased runoff volume is the question which cannot be answered by an analysis at this level. Only with detailed data to evaluate rainfall/runoff/stream response or a calibrated model which utilizes actual data to calibrate its responses can this issue be resolved. There are, however, observations that can be made.

(1) Any area which has uncontrolled urbanization will experience increased BOD

loadings and increased runoff; (2) Any receiving waters which do not adequately dilute these runoff waters will be impacted (stormwater ditches, small tidal streams, any stream where runoff will constitute a majority of water).

The report"A Report on Nonpoint Loadings on Water Quality and Assimilative Capacity"is attached and defines the Intracoastal waterway from Socastee to North Myrtle Beach as the primary area of concern with the Waccamaw River from Conway to the ICWW and the ICWW from G to C plant as other areas of concern.

It must also be understood that the runoff contains other chemicals and material which could affect biota or water quality uses; however, these materials would probably also be noted in those areas previously discussed as having problems for BOD/DO. In the Waccamaw Region all shellfishing areas in the Grand Strand are at least conditionally closed, with the majority of shellfishing waters closed at all times. Discussions with Mr. Ken Moore, Manager of Shellfishing Section DHEC indicate that based on their Sanitary Surveys and special studies it can be stated that almost all of these closures can be attributed to cultural nonpoint influences. The DHEC shellfish program is producing an analysis of shellfish closures throughout the State and until this report is complete it is difficult to identify and isolate specific problems and causes. Fecal Coliform concentrations in stormwater related to Curve number are displayed in appendix 7 on figure 41. Generally,increases of 20% in concentration of bacteria are expected as land use change from present to 2005. Without controls, the runoff from urbanized areas is high enough in bateria that the inlets of the Grand Strand area could probably not provide adequate dilution to prevent shellfish area closures or will increase the intensity and duration of violations where they are presently occurring. There is no doubt, however, of the impacts and the need for a management program to prohibit runoff to shellfishing areas.

Management Agencies

Grand Strand Water and Sewer Authority. In April 1986, the Grand Strand Water and Sewer Authority was designated by the Horry County Council to serve as wastewater service provided for all unincorporated areas of Horry County west of the Waccamaw River. This action eliminated the Horry Water and Sewer Authority. This group was essentially defunct and all operational activities were already being conducted by Grand Strand. The West Horry 201 Plan as designated by the 208, however, remains in effect. There are, however, several major modifications proposed to this plan as outlined in the "Wastewater Facilities Plan for the Longs and Bucksport Communities, 1986." There have been extensive public meetings and public hearings as well as extensive media coverage of this plan and its conclusions. The plans are very similar for both communities and they both have received very strong Community, County, and State support. There have been no objections raised to date with either of these projects.

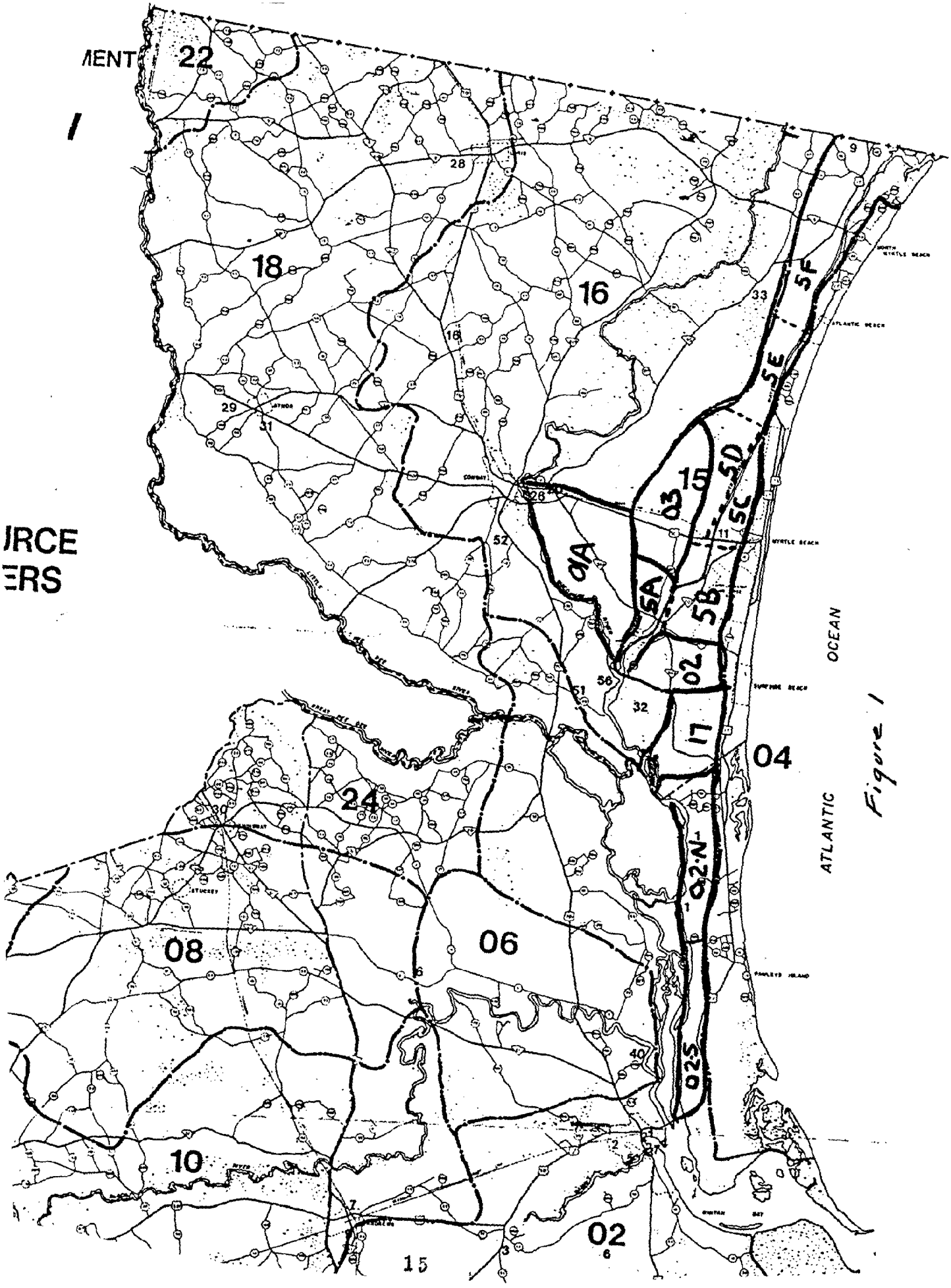
These areas have both been ranked by DHEC as the number 1 and number 2 health-hazard priority areas in South Carolina due to extensive septic tank failures, very poor socio-economic conditions, very poor soil types, and in some homes no sanitary facilities at all. The solution proposed is an Innovative and Alternative collection, transmission, and treatment system. The treatment disposal is proposed as land application with a crop to generate O & M revenues.

The Grand Strand Water and Sewer Authority has been the Designated Management Agency for a significant area East of the Waccamaw River, so there is no need to evaluate their capabilities or responsibilities since they are assuming the full responsibilities of the Horry Water and Sewer Authority. It is recommended through this Update that the Grand Strand Water and Sewer Authority be the Designated Management Agency for the Unincorporated areas of

Western Horry County and that the 208 Plan be modified to reflect the 201 Plan modifications for Longs and Bucksport.

MANAGEMENT STRATEGY: In order to implement a plan to address the water quality issues addressed " A Wasteload Allocation and NPS Coordination. Strategy for the Waccamaw Region" has been prepared (attached). This report provides an implementation strategy for addressing NPS pollution in the Waccamaw Region.

Sub-basin	CN 1985 (2005)	#BOD 1985 (2005)	Acres	24H10Y 6.55 in BOD5 Conc.	24H10Y 6.55 in Volume Runoff ft³	12H1Y BOD5 Conc.	12H1Y Volume Runoff	6H5Y 4.03 in BOD5 Conc.	6H5Y 4.03 in Volume Runoff	6H10Y 4.65 in BOD5 Conc.	6H10Y 4.65 in Volume Runoff	6H1Y
07-15-03	42	$4.3X10^4$	17,894	10.1	$(6.5X10^7)$	105.9	$(6.5X10^6)$	62.3	$(1.1X10^7)$	35.3	$(2.X10^7)$	0
	(56)	$(7.9X10^4)$		8.1	$(1.5X10^8)$	48.5	$(2.6X10^7)$	30.8	$(4.1X10^7)$	23.7	$(5.3X10^7)$	194$(6.5X10^6)$
15-02	43	$2X10^4$	8,320	10.6	$(3X10^7)$	211.8	$(1.5X10^6)$	62.3	$(5.1X10^6)$	33.1	$(9.7X10^6)$	0
	(49)	$(2.7X10^4)$		7.1	$(6X10^7)$	59	$(7.2X10^6)$	25.7	$(1.7X10^7)$	18.1	$(2.3X10^7)$	176$(2X10^6)$
05A	41	$1.5X10^4$	7,040	10.8	$(2.3X10^7)$	485	$(5X10^5)$	67.7	$(3.8X10^6)$	38.8	$(6.4X10^6)$	0
	(50)	$(2.4X10^4)$		8.8	$(4.3X10^7)$	100	$(3.8X10^6)$	37.5	$(1X10^7)$	25.0	$(1.5X10^7)$	0
05B	43	$2.8X10^4$	11,648	10.6	$(4.2X10^7)$	353	$(1.3X10^6)$	55.7	$(8X10^6)$	33.1	$(1.4X10^7)$	0
	(64)	$(7X10^4)$		4.4	$(2.5X10^8)$	46	$(2.4X10^7)$	26.0	$(4.2X10^7)$	20.0	$(5.5X10^7)$	74.4$(1.5X10^7)$
05C	45.5	$1.7X10^4$	6,088	9.1	$(3X10^7)$	206	$(1.3X10^6)$	49.4	$(5.5X10^6)$	29.1	$(9.3X10^6)$	0
	(61)	$(3X10^4)$		8.7	$(5.7X10^7)$	48	$(1.0X10^7)$	26.5	$(1.9X10^7)$	21.4	$(2.3X10^7)$	112.5$(4.4X10^6)$
05D	40	$1.8X10^4$	8,032	12.1	$(2.3X10^7)$	0		97.1	$(2.9X10^6)$	44.1	$(6.4X10^6)$	
	(48)	$(2.7X10^4)$		9.1	$(4.8X10^7)$	115	$(3.8X10^6)$	40.5	$(1.1X10^7)$	27.3	$(1.6X10^7)$	
05E	41	$2.7X10^4$	12,160	10.8	$(4.0X10^7)$	485	$(8.8X10^5)$	66.1	$(6.6X10^6)$	39.6	$(1.1X10^7)$	
	(47)	$(3.5X10^4)$		4.4	$(1.3X10^8)$	128	$(4.4X10^6)$	42.6	$(1.3X10^7)$	27.2	$(2X10^7)$	
05F	45	$4.7X10^4$	17,600	9.5	$(8X10^7)$	170	$(4.5X10^6)$	54.1	$(1.4X10^7)$	29.8	$(2.6X10^7)$	
	(49)	$(5.6X10^4)$		8.8	$(1X10^8)$	118	$(7.7X10^6)$	40.3	$(2.2X10^7)$	27.1	$(3.3X10^7)$	
16-01A	41	$9.7X10^4$	41,984	11.3	$(1.4X10^8)$	0		67.7	$(2.3X10^7)$	40.6	$(3.3X10^7)$	0
	(52)	$(1.5X10^5)$		8.6	$(2.8X10^8)$	72	$(3.3X10^7)$	33.8	$(7.2X10^7)$	25.6	$(9.5X10^7)$	198.6$(1.2X10^7)$
02-17	43	$2.1X10^4$	8,704	10.6	$(3.2X10^7)$	35.3	$(9.5X10^5)$	55.7	$(6X10^6)$	33.1	$(1X10^6)$	0
	(55)	$(3.7X10^4)$		9.2	$(6.3X10^7)$	74	$(7.9X10^6)$	33.7	$(1.7X10^7)$	24.7	$(2.4X10^7)$	232.6$(2.5X10^6)$
02-02-NE	39	$1.3X10^4$	5,925	13.2	$(1.5X10^7)$			13.9	$(1.5X10^6)$	48.9	$(4X10^6)$	0
	(46)	$(1.8X10^4)$		9.8	$(2.9X10^7)$	22.1	$(1.3X10^6)$	53.2	$(5.4X10^6)$	31.7	$(9X10^6)$	0
02-02-SE	42	$1.9X10^4$	8,090	10.6	$(2.9X10^7)$	1059.	$(2.9X10^5)$	62.3	$(5X10^6)$	35.3	$(9X10^6)$	0
	(54)	$(3.2X10^4)$		8.8	$(5.9X10^7)$	70.6	$(7.3X10^6)$	32.1	$(1.6X10^7)$	23.5	$(2X10^7)$	220.6$(2.3X10^6)$
TOTAL		# BOD_5		FLOW (ft^3)		FLOW (ft^3)		FLOW (ft^3)		FLOW (ft^3)		
1985		$10^4X36.5$		$55X10^7$		$17.2X10^6$		$9.2X10^7$		$15.5X10^7$		
(2005)		$(10^4X58.5)$		$(129X10^7)$		$(139.3X10^6)$		$(28.5X10^7)$		$(38.6X10^7)$		
% increase		61%		135%		710%		210%		149%		


22
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ATLANTIC OCEAN

Figure 1

A WASTELOAD ALLOCATION AND NPS COORDINATION STRATEGY FOR THE WACCAMAW REGION

Prepared by Waccamaw Regional Planning and Development Council to meet the requirements of Section 4B. and C.

1. If there is strong evidence that uncontrolled NPS pollutants are impacting uses (shellfishing, assimilative capacity) then the designated NPS and point source management agencies should be evaluated for their existing NPS control program and the possible costs of impacts identified. This should include areas where controls are in place or where development has occurred without controls as well as details of the regulatory personnel and enforcement structure. Once the capabilities of the designated nonpoint source management agency are understood, detailed recommendations should be developed to remedy the problem. Costs should be prepared to evaluate the control programs.

2. In areas identified as potential NPS imapcted areas the procedures should be the same as in areas where uses are known to be impacted. The only difference in approach should be the level of regulatory pressure to implement controls.

Once these areas are identified and control programs and costs have been identified, then the SCDHEC, 208 Designated Management Agencies, and the S. C. Coastal Council should jointly evaluate the information and, based on the level of confidence about the source of pollution and their impacts on uses, develop a management plan for each area. These plans should be prioritized based upon cost of implementation and cost of impacts (among other factors). An implementation plan developed among these agencies with time tables and implementation statements would be a part of the Plan.

A METHODOLOGY FOR PREDICTING THE IMPACT OF NONPOINT POLLUTION ON WATER QUALITY

Prepared by Waccamaw Regional Planning and Development Council to meet requirements of Section 2.B.

A METHODOLOGY FOR PREDICTING THE IMPACT OF NONPOINT POLLUTION ON WATER QUALITY

The identification and delineation of areas where nonpoint source activities may impact water quality can be addressed on several levels. There are those areas where impacts are clearly identified as interfering with classified uses or impacting waste load discharge conditions, and there are areas where impacts may exist and these could be identified as areas of concern and finally there are those areas where we feel confident that nonpoint sources do not presently and will not in the future impact water quality.

Almost all the point source dischargers of the Coastal Zone and especially those of the rapid growth areas are at the assimilative capacity of the receiving waters (An exception to this is the Cooper River/Charleston Harbor system and the Beaufort Area). The rivers which feed these systems are usually swampy or intensively farmed and these farms and swamps contribute high organic loads to the rivers. These loads contribute to reduced D.O. levels, especially in those areas where the rivers meet the sea and the rivers slow down and begin to become tidal in nature. This tidal action increases time for BOD exertion and reduces the ability of the rivers to reaerate. As described in the above sections there is no good way presently available to predict impacts of stormwater loads on assimilative capacity without data or a model. The models of Charleston Harbor and the Beaufort/Port Royal areas predicted no impact on the assimilative capacities of dischargers in these waters. The principal problem is that the waters frequently don't meet water quality standards even without point source dischargers much less nonpoint sources. The Waccamaw/Grand Strand ICWW model predicts less than 5.0 mg/l of D.O. without any point sources due solely to the extended detention times in the system giving the Low D.O., high BOD and TKN time to exert. The Waccamaw model does not have the capability of

of inputting stormwater to assess the impacts on that system. The background conditions described at the beginning of this report frequently originate outside the Coastal Planning areas. For example, the Pee Dee river originates in the Blue Ridge Mountains and drains 16,000 square miles before it reaches South Carolina. There are 2,000,000 people in the Basin with 6% urban and 31% farmed and there are over 300 MGD used by Industries and Municipalities. The problems of trying to isolate the impact of the several dozen square miles of the Grand Strand puts a different light on the problem.

The first step in the identification of potential problem areas is the review of all available sources of information and data. The main sources are STORET sampling stations and intensive stream surveys.

1. Water quality monitoring stations: These are usually utilized to develop long-term trend data and are useful to catalogue changes over time since these stations are only sampled once a month. In tidal areas this information is not correlated with rainfall in the drainage area. Station locations are maintained as defined by the maps produced for this study. The prime catalogue of this data at DHEC is S.T.O.R.E.T. and it can be retrieved by all types of parameters, years, and statistical tests. The literature section identified bacteria as the primary pollutant of concern. Bacteria are measured at the WQ stations, but the primary problems are in shellfishing areas which have their own stations and special studies to delineate these problems. D.O. may be a problem in specific areas and other chemicals associated with runoff could also be problems. The water quality stations are a mixture of data sources, since they may contain other data (special studies) mixed in with regular data, so it is recommended that S.T.O.R.E.T. data be reviewed with DHEC personnel before use of this information. It should also be noted that many of the stations at DHEC are located in response to solving point source problems or identifying

known or suspected water quality problems. The USGS maintains stations that are primarily flow stations, but some are maintained as quality stations. There are no permanent USGS stations in the tidal areas; however, there are special study stations located in the coastal area. Their regular station data is published annually in a summary report.

2. Intensive Surveys: Intensive surveys are usually short but intensive sampling studies conducted in response to specific needs. At DHEC these studies are utilized to identify specific problems and their causes or to calibrate a water quality model for discharger waste load allocations. These intensive studies data are not always published and may remain in report form so you must ask about specific areas. Mr. Mike Marcus is presently the contact for this information at DHEC. The S. C. Water Resource Commission has also conducted a limited number of special studies and these should be reviewed for applicability. The USGS has special studies going on in the Waccamaw Region to identify salt water intrusion, for drinking water facilities, and a mathematical model to simulate their information. They have previously conducted studies like these in other parts of the State.

The 208 Areawide Plans should also be reviewed. The technical information in these plans is over 6 years old now, but much of the data generated is the most advanced and only information available. In some areas this data also contains the only DO/BOD runoff relationship data.

Once these sources have been approached and data specific to the areas of interest are collected and evaluated then those stations and areas with water quality problems can be identified.

A major element in the water quality evaluation of certain waters is the S. C. Water Quality Standards for these waters of concern. In most areas there have been changes in the standards especially in relation to those previously

classified as swamps, so the water quality information should be reviewed in light of the present as well as past WQ standards.

Once the water quality problem stations, problem areas and growth areas are identified then these areas should be noted as existing, potential, or no NPS problem areas. An important element to this is the method to identify future problem areas through existing WQ problems and additional NPS loadings that might be generated by high-growth areas. The literature search and a review of the 208 models indicates that very few NPS Water Quality problems are expected in those areas which were modeled. The reports all identified poorly flushed areas and those strongly composed of stormwater as most likely to have potential problems.

The best information on DO relationships exists in areas where dischargers are located or where major system mathematical models are located (ICWW Waccamaw, Charleston Harbor and Beaufort Harbor). Discharger areas are always modelled and usually they are calibrated using intensive surveys if there are problems in the area. Initially, all Waste Load Allocations for discharges should be reviewed in light of any standards changes and how these may affect future Waste Load Allocations or TMDLs. Another primary factor of this evaluation is the portion of the TMDL assigned to the discharger. If all the TMDL is allocated to pH dischargers and there are also expected increases in NPS loads to these waters, or there are local water quality problems, then these areas should be identified as primary areas of NPS concern.

3. Prioritizing NPS Impact Areas: Once the areas of NPS concern are identified then these areas should be prioritized according to the scale of impact or duration and intensity of impact based on:

A. The potential impact on point source TMDL or waste load allocations.

B. The possible: (a) closure of open shellfishing waters or (b) increasing frequency of conditional closures of shellfish areas or (c) continuing closures of areas already closed.

C. The continued degradation of impacted waters where point sources presently discharge or increases in existing discharges are planned.

4. Evaluation of NPS Impacts: In order to define the impact of NPS discharges on water quality, and particularly on permitted point source waste loadings where regulatory-level action might be needed, either simulation models or extensive water quality data would be required. There are many types of water quality simulation models and the procedures utilized in the application of these are defined the DHEC's Waste Load Allocation Procedures and in the Literature section of this report. It has been stated by DHEC that without a SWMM-Type model which is capable of simulating changes over time and varying flow regimes and the field data nessary to calibrate these accurately there is no way to predict in any useful regulatory manner the possible overlay of NPS conditions as they may affect the low flow water quality conditions that discharger limits are generally set at. In order to assess the needed modelling work and data collection associated with this work it should be recognized that this is a very costly undertaking with extensive man-hours required to set up the physical and hydrologic transport aspects of the model with the cost for these activities easily exceeding a hundred thousand dollars per COG.

collection for calibration of quality portions runoff and receiving water models can be approached in two ways. One is to establish a network of station's which are located to adequately isolate primary contributors and which are sampled frequently enough to understand all ranges of possibilities and their impacts. This method is costly (about $10,000 per station) with a minimum of 2 or 3 stations in smaller watersheds and at least several years data are be needed.

Another method is to conduct synoptic surveys as close to critical event times as possible. These studies can probably be conducted for about $7,000 for each three day study with two surveys being needed at a minimum. These costs of $10,000 per station and $7,000 per synopic survey are potentially available at 50% cost sharing with USGS. There are also possibilities that costs for these studies and/or stations could be shared by the dischargers that utilize these waters. The results of these types of data collection methods will be required by DHEC to develop models and data which they would utilize to evaluate NPS/discharger impacts in order to modify any permit/discharge requirements. The use of the data collected by these methodologys can be utilized for purposes other than modelling. The assessment of data can lead to decisions based upon data analysis alone.

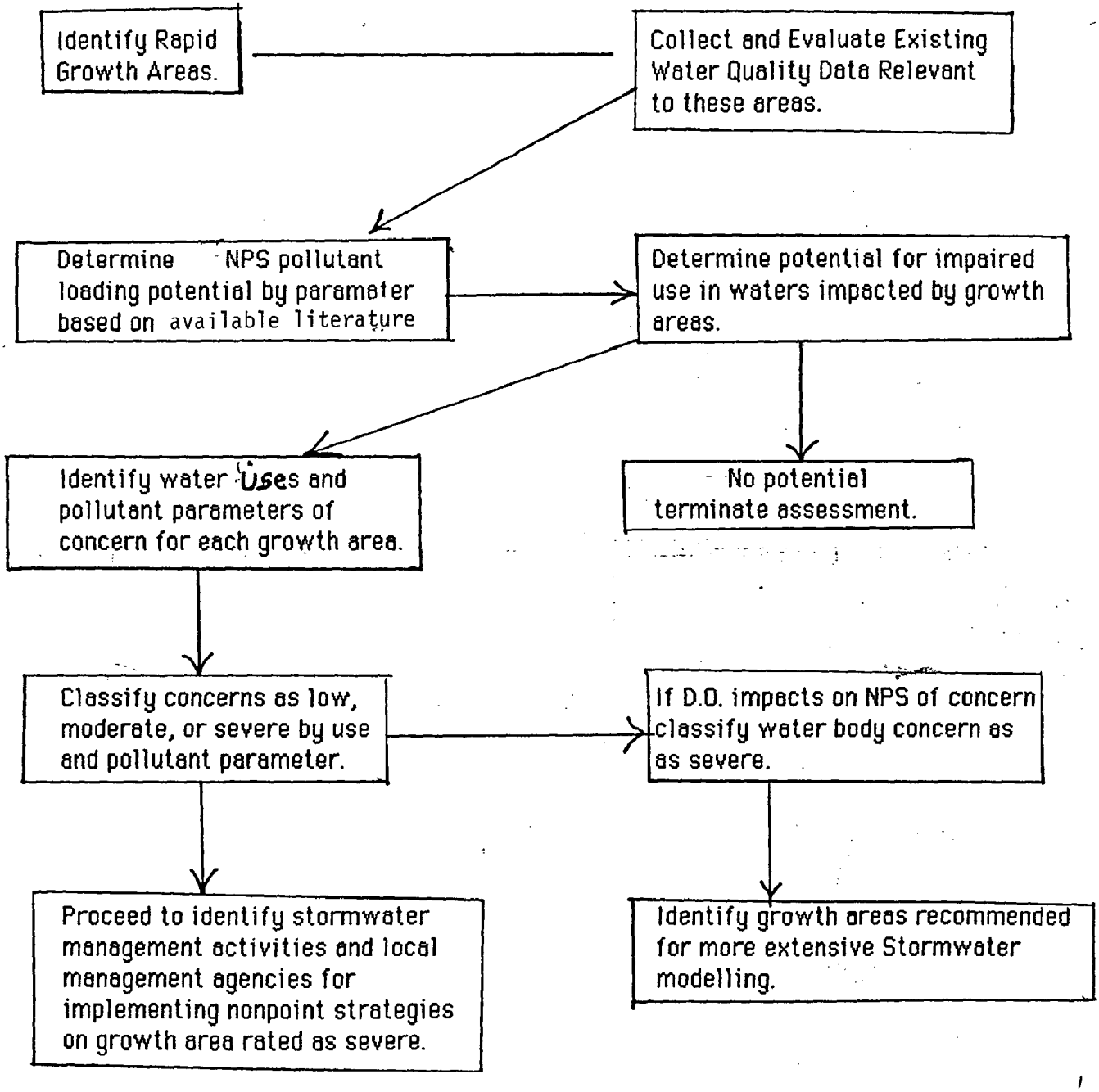
5. Local Managment Methods: In place of this costly and time consuming data intensive approach,a management methodology can be developed. This methodolgy could utilize all the steps mentioned above with the exception of developing new models and then try to develop a 208 management approach to control NPS discharges and their potential impacts.

A. Once WQ problems are identified in rapid growth areas with dischargers utilizing the total assimilative capacity, the point source management strategy could be to encourage (a) land application (b) alternative discharge sites. These decisions could be made on the basis of 208 management needs and water quality goals rather than strict water quality criteria. It should also be recognized that NPS control of pollution is also connected to several other issues. Flood control is a major issue in growing areas especially since much new development is pursued on marginal lands. Flood control is becoming a major cost item with local governments and the control of NPS pollution and flood control can be accomplished with the same techniques. The issue becomes whether the local

government subsidizes development by providing flood controls or the developers assume this cost at development. These costs may also be reduced by innovative planning during development so that development costs may be reduced and property values enhanced. Erosion control is also closely associated with NPS pollution and again controls for one complement the other and local government costs and at times even development costs are reduced with proper NPS control implementation.

B. NPS controls can be implemented by local governments to reduce NPS pollution even without specific, costly models and sampling to identify their impact and costs. These controls can be identified as local goals for local reasons and can be implemented as such. The preferred planning procedure is outlined in the 4 paragraphs above. The methodology is outlined in the attached flow chart.

METHODOLOGY FOR ASSESSING
NONPOINT SOURCE IMPACTS



A REPORT ON THE POTENTIAL IMPACT OF POINT AND NONPOINT SOURCE LOADINGS ON WATER QUALITY AND ASSIMILATIVE CAPACITY IN THE WACCAMAW REGION

Prepared by Waccamaw Regional Planning and Development Council to meet the requirements of Section 1.C.

JUNE 1986

A REPORT ON THE POTENTIAL IMPACT OF POINT AND NONPOINT LOADINGS ON WATER QUALITY AND ASSIMILATIVE CAPACITY

The present land uses and associated nonpoint source loading contribute to background water quality in the Waccamaw Region where the Pee Dee River basin ends after draining 16,000 square miles. The basin begins at the foothills of the Blue Ridge Mountains and over 2,000,000 people live in the basin which is 6% urbanized and 31% farmed. There are over 300 MGD utilized by industry and municipalities. The fact is that in the Waccamaw Region all point source dischargers are presently at the assimilative capacity of their receiving streams due to the nature of the water entering the Region. The proposed increases in future point source flows to handle the growth expected in the Region are layered on this fact. Nonpoint loadings of BOD generated within the Waccmaw Region are expected to increase in a single worst-case summer storm event as much as 60%. Without stormwater controls the overall annual loadings are expected to increase 35%. Nonpoint bacteriological loadings are expected to increase approximately 20% in concentration, but almost all shellfishing areas are already closed due to nonpoint impacts. As described in the Literature and Methodololgy sections, it is not possible in the Waccamaw Region to directly predict the water quality impacts of these loading increases since the system responses are not predictable with existing knowledge and a calibrated model is not available that is capable of simulating these impacts on the DO resources of this region. There are, however, certain assumptions that can be drawn from these observations. Continued uncontrolled runoff from developing areas could affect background conditions for waste load allocations in areas where the assimilative capacity is totally allocated (all the Waccamaw Region), but we cannot yet predict the degree of impact that might be expected. There is, however, sufficient concern over the

potential impact to warrant development of a management strategy to implement nonpoint controls for all new development in order to minimize any further possible impacts that could degrade water quality and cause possible effects on waste load allocations or shellfish closures.

Based upon an analysis of flow data and background water quality the areas where assimilative capacity is most threatened by possible future NPS growth impacts are (1) The Intracoastal Waterway from Socastee to North Myrtle Beach, (2) The Intracoastal Waterway from G and M.B. outfall to 'C' plant and (3) the Waccamaw River from Conway to the ICWW. These areas are expected to see the greatest growth in their drainage areas and there are no stormwater controls in place in these areas except for Georgetown County and the Cities of Myrtle Beach and North Myrtle Beach (which predominantly drain to the ocean). The section of the ICWW from Socastee to N.M.B. is of primary concern because this area is expected to grow significantly and the flows in this part of the system are low and move very slowly during dry weather. If any area is directly impacted it should be in this area. The 2 municipaliteis also get their drinking water from this section of waterway. The wastewater discharges of the City of NMB and the Grand Strand Water and Sewer Authority A plant are in the lower reaches of this waterway downstream from all development. The ICWW model shows a constantly decreasing background D.O. as water moves through this system with no point source or stormwater inputs. This is caused by the high organic loads and low D.O. of the Pee Dee and Waccamaw Rivers, which because of the long detention times in the system, exert their loads creating ever decreasing D.O. conditions near N.M.B. The model is very sensitive to changes in background conditions creating concern that stormwater inputs could be retained in the system long enough that increased loadings could affect water quality enough to create assimilative capacity problems.

The area from G&MB to C Plant is the area with the greatest assimilative capacity so far allocated. These areas are expected to grow rapidly and the Horry County portion has no stormwater controls, creating a possible impact which could over time affect this area's allocation.

The area below Conway is of concern because the City of Conway and Grand Strand are expected to raise wasteload allocation to accommodate Conway area growth and the GSWSA Central facility's wasteload is daily dependant on background water quality conditions.

Impacts which can be documented from NPS are especially noted in shellfishing areas. All shellfishing areas on the Grand Strand are at least conditionally closed to shellfishing and most areas are prohibited to shellfishing due to NPS activities and runoff. Those areas which are presently conditionally closed are subject to full closure as uncontrolled runoff from future developments increases. Especially vulnerable areas are: Little River where there is explosive growth with no stormwater controls; also the Garden City portion of Horry County which discharges stormwater to Murrells Inlet. Areas which would be of great concern in Georgetown County are along Murrells Inlet, Midway Inlet, and North Inlet; however, the development in these areas is under the Georgetown County Stormwater Management Ordinance which incorporates technology identified as reducing bacteriological impacts of development at least 80%. There are areas, especially around Pawleys Island that need sewer badly to reduce the negative impacts of failing septic tanks.

A PLAN FOR FUTURE WATER QUALITY MONITORING NEEDS

Prepared by Waccamaw Regional Planning and Development Council to meet requirements of section 3.B.

MONITORING NEEDS

The adage "you never have enough data" is certainly appropriate to the assessment of nonpoint sources of pollution on water quality in Coastal areas. The variable nature of the events and their unpredictability make it extremely difficult to manually sample for impacts or to depend upon stations which are sampled once a month, especially when trying to address duration and intensity of impact. Based on current technology, this only leaves two approaches to data collection, intensive surveys and continuous monitoring.

Intensive Surveys. These studies are usually conducted two or three days during "worst-case" times, usually hot-summer, low-flow conditions. These studies are useful to characterize stream segments for mathematical water quality simulations of steady-state water quality, identify discharger impacts, or even identify background conditions. These intensive surveys are relatively simple to conduct in free-flowing streams, but become more complex in the tidal areas since samples need to be correlated to tide stage, and flows cannot easily be gauged based upon typical stream rating techniques. The DHEC Intensive Study philosophy has changed recently with studies including biological assessments as well as chemical analysis. The S. C. DHEC annually conducts about 7 comprehensive intensive surveys for the point source evaluation program.

The Coastal surveys scheduled for the future by the 1986 Monitoring Strategy are:

- Ashley River/Charleston Harbor - 1986
- Stono River/Folly River - 1986
- Intra Coastal Waterway (Grant Strand) - 1986

- Sampit River - 1988
- Ireland Creek - 1989

Recent discussions with DHEC personnel indicate that studies are scheduled for the upper Ashley and the Stono River this summer thus, leaving only Battery Creek as an area where surveys are recommended by local 208 staff that are not being addressed by the 1986-1987 DHEC program. A bacteriological survey is also scheduled for Murrells Inlet by the intensive survey group.

The USGS has estimated the labor costs of a 3 day survey with field parameters (DO, conductivity, pH, temperature) and basic chemistry (TKN, BOD_5, Ammonia and fecal coliform) at around $7,000 per survey. The costs of intensive surveys are difficult to identify at DHEC; however, any studies beyond those scheduled for their normal program are not likely since even with funds they are limited by staff and lab capabilities.

Continuous Monitoring. The cost to install and maintain for a year continuous monitoring stations is about $10,000. If there is an existing station, the cost to upgrade an existing USGS guaging station is about $7,000 for adding quality parameters (D.O., TEMP, pH, conductivity). A network of 10 stations has already been installed in the Waccamaw/ICWW of the Waccamaw Region and these stations are funded to operate through this year. It is recommended that these stations be operated for at least another year. The USGS cost estimate to continue to operate this system is $63,000 for another year. The area around Summerville should also be considered for a network of continuous monitors (minimum of 3) at a cost of around $30,000. The need for this network should probably depend on this summer's Intensive Survey's ability to address the problems in the area.

The Lowcountry COG has identified Battery Creek as their primary potential NPS impact area and a 2-event intensive survey at $15,000 should provide good preliminary background information. There still needs to be bacteriological surveys of the Hilton Head shellfish areas to identify pollution sources causing proposed shellfish closures, especially as this problem relates to marinas.

The Waccamaw Region's primary NPS impacts and needs are primarily in closed shellfishing areas, especially those where sanitary surveys have not been completed. Murrells Inlet is an area of interest since a sewer system has been installed recently and the improvements expected from sewer installation need to be documented. Also, the Pawleys Island area should be surveyed since sewer is due to be installed in this area in order to address sources of bacterial contamination.

The costs of all the USGS studies and stations are based on possible 50% USGS match so these costs might be ½ those identified. The possibility of local cost sharing for these studies should also be investigated.

In summary, the needs for water quality intensive surveys of DO/BOD are being addressed in the BCD area through the normal DHEC program; however, it may prove useful to install several continuous monitors near Summerville at a cost of $15,000. The Waccamaw Region needs to continue the 10-station continuous monitors for at least another year with match costs of about $32,000. Some intensive surveys might albo be useful on Battery Creek (Beaufort) at a match cost of about $7,000. Survey costs and proposed study areas for bacteriological studies in shellfish areas are in preparation by DHEC and not available for this report; however, the need for understanding the NPS role in shellfish area closures throughout the State is an obvious need for monitoring efforts.

SUMMARY

208 UPDATE II

Prepared by Waccamaw Regional Planning
And Development Council

JUNE 1986

SUMMARY

208 UPDATE II

This report contains two 208 Update Reports. These were produced under separate contracts so the work is being kept distinct for contractual purposes.

The Update II is presented in several sections:

A. Total Maximum Daily Loads: The Waccamaw Region has received assimilative capacity loads for all major dischargers in the Region. These TMDL's have been changing based on new Standards and Water quality information. There is a need for better monitoring data to understand the flow/quality relationships to define "critical" water quality events.

B. Non Point Source Controls: There has been a new network of monitors installed to assess NPS impacts. It is noted that if Nonpoint pollution is defined as a problem the separation of designated point/nonpoint management agencies presents management/coordination problems.

1. Regulatory programs: all three Horry County Coastal Municipalities have implemented Stormwater Management Ordinances as has Georgetown County.

A Memorandum of Agreement was signed between DHEC and Waccamaw providing for 208 certification of all NPDES, PER and waste load requests and designates the 208 agency as a coordinating agent.

The Primary future regulatory push will be to bring Horry County to Stormwater Management Program.

2. Management Agencies: 208 agency changes completed since the last Update were:

Little River - designated September 23, 1983 for collection and transport only of wastewater.

City of North Myrtle Beach - point source designated February, 1984 with an updated 201 facilities plan. It is noted that the flow projections in this plan are not adequate for 20 years and there will be a need to modify the plan in the next few years.

Georgetown Water and Sewer District - 'C' Plant 201 is in review. The new Wachesaw PER is 208 approved to transfer flow from 'G' plant and construct a new 1.2 MGD facility.

Myrtle Beach - A P.E.R. has been certified for an increase from 12.5 to 17.5 MGD. This is only an interim upgrade and no alternatives have been developed for disposal of up to 25 MGD as the 2005 flow.

City of Conway - Recently certified to increase flow from 1.2 to 2 MGD to meet existing flows caused by overloading. Future expansions will be needed but there are service area agreements and planning issues to be resolved before new flows and wasteloads can be established.

3. Municipal Needs: Local flows are expected to increase from 28 MGD presently permitted to 68 MGD in 20 years.

It is stated as the Waccamaw 208 Policy that all private facilities should be eliminated whenever designated agency systems are available or these private facilities should turn over operation and maintenance to the Designated agency as soon as feasible. No new private facilities should be permitted.

4. Urban Stormwater: Local regulatory programs combined with S.C. Coastal Council Guidelines has strengthened the Waccamaw NPS program.
5. Inventories and Projections: New Land Use and Population projections are contained in this section.
6. Discharger Inventory: A new list of Dischargers in the Region are provided.

WACCAMAW REGIONAL PLANNING AND DEVELOPMENT COUNCIL 208 AREA WIDE WATER QUALITY MANAGEMENT PLAN UP-DATE II

APRIL, 1986

INTRODUCTION

This is the second formal 208 update produced by the Waccamaw Areawide Water Quality Management Plan. The original plan was produced in 1978 and the first update was published in 1981. This report will summarize the changes made primarily to Management Agency designations and will also address population and Land Use projections for the Waccamaw Region. Appendix I summarizes the conclusions of the previous 208 Update.

A. TOTAL MAXIMUM DAILY WASTELOAD ALLOCATIONS

There has been significant progress in this area. The SCDHEC has established waste load allocations for all dischargers, and a Memorandum of Agreement has been signed (Appendix II) which outlines responsibilities in allocation of wasteloads and 208 certification of permit requests. All TMDL's have not yet been assigned by DHEC.

The TMDL concept is becoming more complex as wasteloads are based on flow and water quality conditions other than 7Q10 conditions. Future needs for these TMDL's and WLA's involve the need for monitoring data to understand the flow/quality relationships to define "critical" water quality events.

B. NON-POINT SOURCE CONTROLS

In addition to the controls identified in the previous 208 Update there had been significant improvement in non-point regulatory programs. There has also been a recent effort to upgrade the level and quality of water quality data through a contract with the United States Geological Survey to establish10 Water Quality Monitory Stations in the Waccamaw Region and collect data on15 minute intervals at those stations for D.O. Ph, conductivity tide, stage, and temperature. This intensive water quality data suplemented by laboratory "wet" information (BOD, NH4 etc.) should prove invaluable to understanding the changes created in water quality and subsequent assimulative capacity of coastal tidal rivers and by non-point sources.

Presently in the Grand Strand area all major discharger waste loads are at their maximum level (i.e. at secondary treatment or more for effffluent flows). The present rate of growth could lead to more than doubling of the existing point source flows with no increase in assimilative capacity. This means for riverine discharges, increased treatment will be required for increased flows. The assimulative capacities of the rivers could be reduced if non-point sources of pollution decrease background water quality further or it is found there are other critical periods.

The continued separation of point source and non-point source control management agencies, presents potential problems if non-point sources are determined to be a factor in wasteloads in the future and coordinated management is required of the point and non-point loadings in an area.

1. Regulatory Programs:

   The three principal coastal municipalities in Horry County (Surfside Beach, Myrtle Beach, North Myrtle Beach) have all adopted Stormwater Management Ordinances within the past 2 years. However, Horry County has not yet developed a Stormwater Management Ordinance or Zoning Ordinance. These Horry County municipalities have joined Georgetown County which has had its program in place since 1983. These ordinances combined with the S.C. Coastal Council's Stormwater Management Guidelines (applicable throughout Horry and Georgetown Counties) have established a program to minimize pollution from developments which meet their criteria.

   These Coastal Council Stormwater guidelines outline standards for stormwater Retention/Detention based upon distance from receiving waters, and implement best management practices where required. The S.C. Coastal

Council Guidelines are primarilarly implemented through their certification of other agency permits.

In November 1985, a Memorandum of Agreement was signed between DHEC and Waccamaw COG. This memorandum provided for a formalization of the 208 process as related to certification of NPDES permit requests as well as Preliminary Engineering Reports, wasteload allocations and construction permits. The agreement also describes a coordinating role with other agencies such as the Corps of Engineers and the S.C. Coastal Council.

A primary future focus of the 208 program in the Waccamaw Region should be to work towards a stormwater control program in Horry County. Horry County is presently drafting a Zoning Ordinance which should help control development impacts, and the Planning Commission has formed a Committee to develop a Stormwater Program.

2. Management Agencies:

There have been several changes in Designated Management Agencies since the last Update:

Little River was designated a management agency for collection and transport only of wastewater in the 'A' Plant service area and was certified and approved on September 23, 1983.

City of North Myrtle Beach has been designated a point and non-point source management Agency on February 16, 1984 and has since received a 201 grant to update the treatment facilities. The 201 facility under construction is not adequately sized to meet 20 year future flows, so that

sometime in the near future a 208 Plan modification will need to be submitted for review and certification.

Georgetown Water and Sewer District is presently working towards implementing a 201 grant for 'C' Plant.

A Preliminary Engineering Report (PER) was also approved by the 208 on February 14, 1984 to develop land application/River discharge system at Wachesaw for 1.2 MGD. 500,000gpd planned for the new facility presently flows to Grand Strand's 'G' Plant. The Garden City Point 350,000gpd would continue to flow to Grand Strand 'G' Plant. The new flows of 1.2 MGD would come from growth in the area plus the recaptured 500,000gpd flow from 'G' Plant.

Myrtle Beach presently has an approved P.E.R. request to upgrade from 12 to 17.5 MGD, however, the 20 year projected flow of 24 MGD or more has not been addressed by this PER proposal. The present proposal is to treat the additional 5 MGD to higher treatment since there is no additional assimilative capacity at their present discharge site. Future flows must be addressed before any future upgrades are allowed so that a comprehensive plan for growth and sewer disposal can be prepared.

Grand Strand Water and Sewer Authority has prepared a 208 approved Master Facilities Plan for all their facilities in the area. This document contains 20 year projections for the existing primary facilities and 2 projected new facilities. All these facilities are scheduled for upgrades and all three will utilize some form of land application for treatment of some portion of the

flow. This new updated facilities Plan for Grand Strand contains several changes in service areas for facilities, which are complex and outlined in the Plan, however, an outline is attached (Appendix III). All these changes were presented at a December, 1985 public hearing and approved by the Waccamaw Regional Planning and Development Council's Board of Directors.

City of Conway recently was approved to increase wastewater treatment capacity from 1.2 MGD to 2 MGD to meet existing flow requirements. The existing facility will need to be upgraded for any expansions and future flow increases will depend on water quality monitoring requirements for the recent upgrade and the 20 year projections for the proposed service area. Waste Load allocations for any increases are also not yet prepared. There are also problems with service area agreements and these need to be resolved before any treatment Plant upgrades, since the service areas will need to be established before flows can be established and allocated for waste loads.

Town of Loris is presently conducting an evaluation and correction program to rehabilitate the old portions of their collection system. It is anticipated that this correction should allow adequate capacity to meet the town's needs for the future.

3. Municipal Needs are addressed by the individual 20 year facility plans developed or in the process of development by management agencies and amounts to a change in flows from 26 MGD presently permitted to at least 66 MGD in 20 years. Most private facilities have been eliminated by the 201 expansions, however, it is the policy of the Waccamaw 208 program that no

private facility can meet the 208 requirements for management, and therefore, should be eliminated when designated wastewater systems are nearby, or these facilities should turn over operation and maintenance to the designated management agency in their service area as soon as feasible.

4. Urban Stormwater:

No new data has been developed since the 1980 Update, however, the Nationwide Urban Runoff Program National Report has been released and a report is due in mid-1986 which will outline the state of knowledge about Urban Stormwater impacts on S. C. Coastal Water Quality. The implementation of Stormwater controls by the Grand Strand Municipalities and Georgetown County combined with Coastal Council's certification program of Stormwater Guidelines has provided a strong program to prevent any future degradation of water quality in those areas receiving runoff from these areas.

There have been virtually no new stormwater outfalls on the beaches of the Region since these programs have been in place.

5. Inventories and Projections:

Populations changes for the Waccamaw Region through 2005 are outlined on table I. The land use changes expected are shown on table II.

C. DISCHARGER INVENTORIES

The list in Appendix IV identifies all permitted wastewater discharges in the Waccamaw Region and was supplied by DHEC in December, 1985.

There are 6 permitted facilities in Williamsburg County with 2 major municipal discharges (Kingstree, Hemingway). There are 2 small industrial dischargers to the Kingstree facility and one major industrial discharger.

Georgetown County has 29 permitted facilities. Thirteen of these are industrial and 7 are minicipal, two are private facilities (DeBordieu and White's Creek) 5 school community facilities are in the County. The two community facilities operated in Georgetown County as private facilities are not operated by Designated Management Agencies. These facilities should be eliminated or operated by designated Management Agencies as soon as possible. No new permits, expansions or upgrades should be permitted for these facilities until an evaluation of the feasibility of public operation or elimination of these facilities is addressed.

Horry County has 9 municipal facilities, 5 private community facilities and 12 industrial facilities. The private facilities should be eliminated or operated by Designated Management Agencies. No new permits expansions or upgrades should be permitted for these facilities until an evaluation of the feasible.

TABLE I

POPULATION PROJECTIONS

HORRY COUNTY

Census County Division	1985	1990	1995	2000	2005
AYNOR					
PERSONS					
Permanent	7,999	8,751	9,546	10,285	11,135
Overnight	----				
Day	----				
CONWAY					
Permanent	27,349	30,752	34,121	37,412	40,987
Overnight	----				
Day	----				
CONWAY EAST					
Permanent	12,175	12,573	19,102	22,339	25,934
Overnight	2,612	3,952	5,292	6,632	7,972
Day	14,980	19,443	23,906	28,369	32,832
FLOYDS					
Permanent	4,054	4,459	4,629	4,920	5,218
Overnight	----				
Day	----				
LITTLE RIVER					
Permanent	10,836	12,573	15,548	18,205	20,246
Overnight	77,701	88,948	100,195	111,446	122,689
Day	17,467	22,671	27,876	32,734	38,740
LONGS					
Permanent	3,404	3,466	3,685	3,861	3,962
Overnight	----				
Day	----				
LORIS					
Permanent	12,240	13,697	14,291	15,038	16,298
Overnight	----				
Day	----				
MYRTLE BEACH					
Permanent	44,567	52,457	62,570	72,222	81,129
Overnight	153,782	175,324	194,865	214,907	233,948
Day	27,639	36,575	45,511	54,449	63,384
COUNTY TOTAL					
Permanent	120,910	139,677	161,073	181,481	201,770
Overnight	234,095	268,224	300,352	332,985	364,609
Day	60,068	78,689	97,293	115,552	134,956

POPULATION PROJECTIONS

GEORGETOWN COUNTY

WACCAMAW NECK					
Permanent	9,138	11,913	14,024	16,295	18,910
Overnight	32,480	39,041	47,302	55,562	63,822
Day	9,394	11,491	13,579	15,684	17,782
GEORGETOWN AREA					
Permanent	21,240	23,477	24,752	26,303	28,263
REMAINDER OF COUNTY					
Permanent	17,978	19,010	21,201	23,102	24,425
TOTAL OF GEORGETOWN COUNTY					
Permanent	48,356	54,400	59,977	65,700	71,598

TABLE II

HORRY COUNTY GROWTH AREA LAND USE-ACRES

	1985	1990	1995	2000	2005
RESIDENTIAL	16,684	18,729	20,724	22,569	25,107
COMMERCIAL	2,163	2,588	3,011	3,435	3,856
INDUSTRIAL	1,778	1,887	1,995	2,103	2,230
PUBLIC-SEMI-PUBLIC	7,199	7,690	7,795	7,901	8,063
OTHER	403,687	400,617	397,986	395,503	392,255
TOTAL	431,511	431,511	431,511	431,511	431,511

GEORGETOWN COUNTY GROWTH AREA LAND USE

	1985	1990	1995	2000	2005
RESIDENTIAL	8,270	9,246	10,222	11,176	12,275
COMMERCIAL	511	583	605	665	725
INDUSTRIAL	1,610	1,738	1,866	1,986	2,005
PUBLIC-SEMI-PUBLIC	24,834	25,104	25,369	25,511	25,800
OTHER	213,534	212,081	210,780	209,504	208,037
TOTAL	248,842	248,842	248,842	248,842	248,842

WACCAMAW REGION GROWTH AREA LAND USE

	1985	1990	1995	2000	2005
RESIDENTIAL	24,954	27,975	30,946	33,745	37,382
COMMERCIAL	2,674	3,171	3,616	4,100	4,581
INDUSTRIAL	3,388	3,615	3,861	4,089	4,235
PUBLIC-SEMI-PUBLIC	32,033	32,794	33,164	33,412	33,863
OTHER	617,221	612,698	608,766	602,317	600,292
TOTAL	680,353	680,353	680,353	680,353	680,353

APPENDIX I

WACCAMAW REGIONAL PLANNING AND DEVELOPMENT COUNCIL

208

WATER QUALITY MANAGEMENT PLAN

UPDATE

Waccamaw Regional Planning and Development Council

Georgetown, South Carolina

January, 1981

This Report was financed through a grant of the
U. S. Environmental Protection Agency (EPA) under Section 208 of the
Federal Water Pollution Control Act Amendment of 1972 (PL 92-500).

Chapter 1

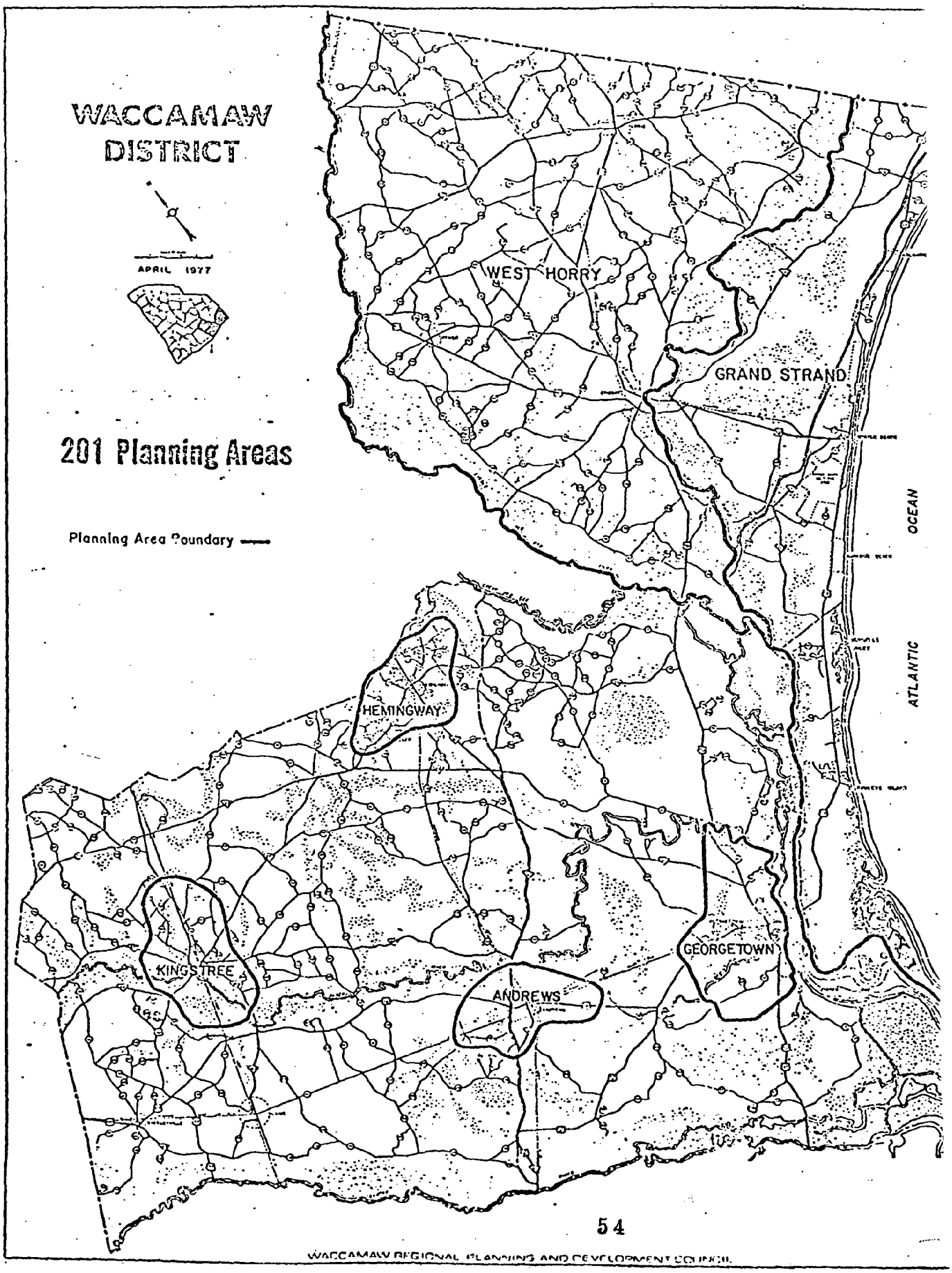
INTRODUCTION

Concern throughout the United States about the health and economic problems related to water quality helped to prompt passage of the Federal Water Pollution Control Act of 1972. This legislation cited as its objective the restoration and maintenance of the "chemical, physical and biological integrity of the Nation's waters".

Section 208 of this 1972 legislation (Public Law 92-500) calls for areawide waste treatment management, preceded by an extensive planning process. Waccamaw Regional Planning and Development (WRPDC) has been designated by the Governor of South Carolina as the agency responsible for areawide wastewater management planning in Georgetown, Horry, and Williamsburg Counties. As a result of this designation and funding from EPA, an areawide wastewater planning effort has been conducted in the Waccamaw Region with the responsibility to initiate a comprehensive waste treatment planning process and to produce areawide water quality plans. In addition, Section 208 calls for designation of management agencies to implement plans that seek to have the waterways of the Region fishable and swimmable by 1983.

WRPDC published the 208 Plan in 1978 which was the culmination of almost four (4) years of work by the Waccamaw Staff and three (3) consultants. In October, 1978 a Continuing Planning Program (CPP) grant was given to WRPDC to continue the planning process and implement the Plan. The following grant (CPP-2) was given to WRPDC in July, 1979. These work plans are presented in Appendix A (CPP-1) and Appendix B (CPP-2).

There are seven (7) 201 Planning Areas in the Waccamaw Region. A summary of each plan is presented in the 208 Plan and a map of these areas is on the following page.


WACCAMAW
DISTRICT
APRIL 1977
201 Planning Areas
Planning Area Boundary
WEST HORRY
GRAND STRAND
OCEAN
ATLANTIC
HEMINGWAY
KINGSTREE
ANDREWS
GEORGETOWN

Chapter 2

- SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS -

The following sections present a summary of the conclusions and recommendations from the 208 Plan and from the work accomplished under the CPP's.

208 PLAN CONCLUSIONS AND RECOMMENDATIONS

This section presents engineering and water quality conclusions and recommendations from the 208 Plan.

Engineering Conclusions and Recommendations

A. Regional Construction Priority Criteria (E8.10)

Conclusions and Recommendations:

1. The priority system should be expended to include: a) non-point sources; and, b) to provide a mechanism for ranking all types of projects for use by local and regional officials.

B. Structural Source Control and Reduction Options (E8.30)

Conclusions and Recommendations:

1. After evaluating the options available it appears that the most feasible alternative for control of existing stormwater problems in Myrtle Beach is through a series of ocean outfalls sized to carry multiple storm sewer discharges away from the beach and well out into the ocean. However, the water quality implications of this needs to be fully evaluated and a detailed study instituted to prepare the information necessary for engineering design of a control system.

C. Regional and Effluent Monitoring Program (E8.50)

Conclusions and Recommendations:

1. Existing laboratory facilities in the Region are not adequate to efficiently conduct operational testing or water quality monitoring.

   An inventory of the existing government owned wastewater treatment facilities in the Waccamaw Region revealed that many of the facilities utilize private laboratories for sampling and testing and conduct only those tests required for compliance with NPDES permit requirements. Representatives from all the agencies interviewed expressed an interest in a regional monitoring program.

   As the inventory of existing laboratory facilities in the Wacca-

maw Region indicated, existing laboratory testing facilities and procedures are not adequate to meet the water quality requirements of the area.

2. It is recommended that a regional effluent monitoringprogram for the Waccamaw Region be instituted.

3. A short-term water quality monitoring program for the Waccamaw Region was developed as part of the 208 planning. The Program was used to gather data for calibration of the lower Intracoastal Waterway Model. It is recommended that a program for regularly sampling these stations be developed as part of the regional monitoring program.

4. Recommended to be included into the regional monitoring program is the sampling of streams upstream and downstream of significant point source discharges.

5. A regional effluent monitoring program should meet the requirements of the area, provide adequate, efficient sampling and testing at the lowest possible cost, employ qualified personnel, contribute to reaching the water quality goals of the Region, and be acceptable to all the agencies using the facilities.

6. It is recommended that a program of sampling and testing be implemented; that is, individual laboratories coordinated by a regional operator. A program as presented would promote effective, efficient treatment plant operation, contributing to the enhancement of water quality in the Region. Coordination of sampling and testing by a regional operator would insure that testing prescribed by the program is conducted and that accurate records of the results are kept.

Water Quality Conclusions and Recommendations

Water quality problems studied for Waccamaw Regional Planning and Development Council's 208 program focused on three (3) priority stream segments; the Intracoastal Waterway (ICWW) from Bucksport to Little River Inlet, Waccamaw River from Bucksport to Winyah Bay, and the coastal area from Little River to Georgetown. While water quality problems in Georgetown, Horry and Williamsburg Counties are not limited to just these areas, sufficient funds were not available for an indepth evaluation of all existing water quality problems. Therefore, these three areas with high priority were evaluated in the initial 208 planning process.

Water quality evaluations were based on existing water quality data, additional data collected during the planning process, and a computer model of the Intracoastal Waterway (ICWW)/Waccamaw River/Winyah Bay complex from Little River Inlet to Winyah Bay. Based on these water quality evaluations, the following conclusions were drawn:

1. The overall quality of water in the 208 area is good. However, a number of local problems exist, primarily because of municipal or industrial waste discharges. General overland runoff

with its resulting pollution (non point source pollution) also contributes to water quality problems in some areas of the Waccamaw Region.

2. The worst stream segment in the area in terms of existing water quality is the Intracoastal Waterway from Bucksport to Little River Inlet.

3. Planned wastewater treatment facilities, when operational, will result in water quality improvements.

4. The national goals of the Water Pollution Control Act Amendments of 1972 (Public Law 92-500) calling for fishable and swimmable waters in the United States by 1983 are obtainable in the Waccamaw Region. Through a combination of controls of point and non-point sources of pollution, an effective program is possible.

The most important regional water quality problems are as follows:

1. Bucksport Landing to Little River Inlet

The ICWW between Bucksport Landing and the Little River Inlet is a narrow, shallow, man-made channel constructed and maintained by the U. S. Army Corps of Engineers. Net velocity in the channel is very low and estimated detention time of the channel may exceed 40 days during a 7-day, 10-year low flow. Previous studies and current water quality data indicate that this stream segment is frequently subject to water quality violations for dissolved oxygen and fecal coliform standards. Model runs with the ICWW model indicate that point source discharges to the segment should provide advanced waste treatment prior to discharge. The segment receives no major freshwater input for its entire length, for northward flows from the Waccamaw/Great Pee Dee River complex. A number of swamps drain to the segment, however, and previous studies indicate that these swamps may be significant non-point pollutant sources. The ICWW model indicates that water quality violations will occur even if no point source discharges were present along the segment.

Data collected in the non-point source sampling program incates that significant stormwater discharges to the ICWW could result in further deterioration of water quality. It is recommended that other alternatives, primarily those involving non-structural controls, be utilized to minimize the discharge urban runoff to this stream segment.

2. The Sampit River

The Sampit River is a coastal river which drains a portion of lower Georgetown and Williamsburg Counties. The area drained by the Sampit River consists primarily of swamps, freshwater marshes and abandoned rice fields. Existing DHEC data indicates that non-point sources may be a problem in this stream segment. The Sampit River also receives a number of point source dis-

charges, including municipal discharge from the City of Georgetown and industrial discharges from Georgetown Steel and International Paper. Due to the large volume of these discharges and the nature of the wastewater, the International Paper discharge has the most significant impact on water quality.

Waste load allocations for this stream segment were not developed in this study. A study by EPA and International Paper is currently being conducted to determine the acceptable level of treatment for industrial discharges to this stream segment.

3. Winyah Bay

Winyah Bay extends from the junction of the Pee Dee and Waccamaw Rivers at U. S. 17 to the Atlantic Ocean. The bay varies in depth from approximately 30 feet in the main channel to less than two (2) feet in more shallow areas at mean low water. The primary water quality problem in this area is shellfish waters which have been closed due to bacterial contamination. Studies are currently being conducted to identify the source of this bacterial contamination.

Other problems in the area of the bay include sedimentation and disposal of dredge spoil. The Pee Dee/Waccamaw River system drains almost one-third (1/3) of the total land area in North and South Carolina; therefore, much of the sediment deposited in the bay has been transported long distances. Annual dredging is required at a number of locations to maintain the proper depth in navigational channels which lead from docks in the area of Georgetown to the Atlantic Ocean. The impact of dredge disposal sites on water quality was not evaluated in this study, a review of data collected in other areas indicates that the impact may be significant, especially with respect to heavy metals and pesticides.

4. Murrells Inlet

Previous studies and water quality data collected and evaluated in the non-point source sampling program (Appendix 7), indicates that non-point sources may have a significant impact on water quality in the area of Murrells Inlet. Specifically, the oyster beds in the area are closed for a three-day period following heavy rainfall (in excess of 1 inch) due to fecal coliform contamination. Data also indicates that recommended criteria may be exceeded for heavy metals concentration, primarily mercury and lead, during wet weather flow.

Additional studies should be conducted to better define the frequency and distribution of heavy metals in area runoff. The most probable source of heavy metals is highway runoff. The fate of metals in the marshes of the inlet should also be determined. Excessive levels of heavy metals could indicate s significant long-term problem; however, existing data is insufficient for an accurate assessment of the problem, and additional data

should be collectec. This is recommended as an area of further study under continuing water quality planning.

Data collected in the 208 Program indicates that septic tanks may be the primary source of fecal coliform bacteria. Fecal coliform problems attributable to septic tanks should be alleviates upon completion of the planned collection system for the area outlined in the Grand Strand 201 Facilities Plan. Further development in the area, especially the paving of roads and parking lots and intensive construction of houses and condominiums, may offset potential gains in water quality by increasing the volume of urban runoff which typically contains significant numbers of coliform organisms.

5. Urban Runoff to Beach Areas

Previous studies, data collected in the 208 Program, and data from other areas indicate that stormwater discharges to beach areas may represent a significant threat to water quality in coastal areas. Fecal coliform densities in the surf zone often exceed recommended criteria during and after precipitation events. Observed heavy metal concentrations also exceed recommended criteria for lead. The primary source of both pollutants is urban runoff.

The limited data available indicates that a more thorough evaluation of storm sewers discharging to beach areas should be conducted. Future planning efforts for new development in coastal areas should concentrate on minimizing the increase of stormwater runoff. Continued increases in stormwater discharges may require periodic closing of beaches and greatly increased erosion problems. Both adverse impacts could have a significant eocnomic impact on the area.

6. Swamps

Data collected in the 208 Program and current DHEC quality data indicates that swamps may represent a significant source of non-point pollutant loads. Existing data indicates that, in general, swamp waters exhibit higher BOD concentrations, higher temperatures, higher fecal coliform counts, low pH, and lower dissolved oxygen than flowing surface waters in the same geographic area. These freely-flowing surface streams serve as outlets for many of these swamps. Pollutant loads from swamps may be important under high and low flow conditions. Additional studies should be conducted in the area ot better define the complex hydrologic interrelationships between major swamps and area streams.

Man's activities may increase the pollutional output of swamps. Although not investigated by this study, it is thought that activities such as timber harvesting and road building may result in increased pollutant discharge from affected swamps.

Water quality degradation in natural swamps is largely un-

controllable; however, this area should receive additional investigation for better understanding. This research would also provide data for evaluating alternatives to reduce pollutant loads from swamps subjected to timber harvesting and other disruptive activities.

In summary, the water quality problems or potential problems discussed above have been identified to date. While other water quality problems undoubtedly exist within the Region, it has been the purpose of this study to address only those known problems of highest priority.

C.P.P. Conclusions and Recommendations

A. There is a need for close cooperation and understanding between separate NPS and point source management agencies due to the overlap and complexity of Home Rule and enabling legislation.

B. Zoning and subdivision regulations are essential components for effective control of NPS pollution related to growth and development.

C. A comprehensive stormwater control program in Myrtle Beach can serve as a model for other communities through the Waccamaw Region.

D. The S. C. Water Quality Standards and Classification System should more clearly identify the criteria and procedures used in defining water quality analyses.

E. An approach utilizing non-structural controls will result in immediate reductions in stormwater and prevent the situation from getting any worse. The collector system will require extensive funding and is more long-term.

F. Collection of stormwater through an inteceptor located in Ocean Boulevard appears to present the best alternative.

G. Discharge of collected and disinfected stormwater at one site, (Withers Swash) rather than a diffuser pipe, is the best alternative for discharge.

H. The following observations were drawn from the sampling analysis information gathered during this study:

1. The wet weather surf data contains significantly higher total and fecal coliform counts than the dry weather surf data;

2. Class SA standards are violated in the surf during wet and dry weather in Section 5. Class SA applies to saltwater suitable for propagation, survival and harvesting of shellfish for market purposes;

3. Class SB standards are violated in the surf during wet weather in Section 5, but not during dry weather. Class SB applies to saltwater suitable for direct water contact and propagation of shellfish except shellfish for market purposes;

4. Class SA standards are violated in the surf for each storm event examined;

5. Class SB standards were violated in the surf for each storm event sampled during peak tourist season (June, July, and August). During the nonpeak tourist season, six (6) of nine (9) storm events violated Class SB standards (generally by the 10% requirement);

6. The data is inconclusive in establishing tidal influence on coliform counts in the surf;

7. A significant coliform reduction in the surf is observed between 10 and 22 hours after a storm has ended;

8. Comparative stormwater samples collected in surrounding municipalities showed that seven (7) of the eight (8) locations had fecal coliform geometric means of greater than 400 counts/100 ml.;

9. The monthly surf data indicates that during the tourist season, the coliform counts are higher than in the nontourist season;

10. Street samples collected during peak tourist season revealed extremely high coliform counts:

11. The major source of coliforms found in the stormwater originate from accumulation on impervious surfaces;

12. Coliforms available for transport to the storm system appear to be proportional to the number of people in Myrtle Beach;

13. The source sampling did not produce any areas which could be called free o bacterial pollution. Generally all source samples taken showed consistently high coliform counts;

14. Water quality standards are violated in Withers Swash;

15. The direct beach discharges, natural beach pools, and pipe stream samples have significantly higher coliform counts than the surf samples;

16. The wet weather direct beach discharge and beach pool data contains significantly higher total and fecal coliform counts than the dry weather data;

17. The direct beach discharges, pipe stream, and natural beach pool samples showed high coliform counts during wet weather. The fecal coliform counts in the direct beach discharges (during wet and dry weather conditions combined; exceed all present freahwater standards; however, the State of South Carolina has no standards for that type of water discharge;

18. Reducing the amount of impervious surfaces and pavement draining into the storm sewer system should reduce the number of coliforms in the surf;

19. The storm system discharge poses a greater health threat than the surf. Fresh water coming out of the pipes far exceeds public health standards for health protection;

20. There is body contact between storm sewer discharges and people. The greatest potential for health impacts is in storm system discharge regardless of whether the state and/or Federal standards are applied, i.e., pathogens may exist; and,

21. Removal of urban stormwater runoff entering the surf through drain pipes and street runoff will result in water quality improvement and reduce contact exposure to the public.

The stormwater study while analyzing the data and developing the conclusion that stormwater discharging across the beach creates potential health as well as aesthetic and erosion problems, has identified approaches to reduce and eliminat the stormwater. The approaches can be divided into two (2) major categories:

1) Structural - representing a technique of intercepting the existing stormwater generated from roads and other impermeable surfaces and transported to the beach via major stormwater pipes; and,

2) Non-Structural - which will prevent the runoff from increasing with development and also can be used to reduce existing runoff from small sites. This approach also includes ordinances covered in 4.E.(b) Regulatory and Other Programs.

APPENDIX II

MEMORANDUM OF AGREEMENT

The intent of this Agreement is to define the responsibilities of the South Carolina Department of Health and Environmental Control (SCDHEC) and the Waccamaw Regional Planning and Development Council (WRPDC) for the review of requests to begin or to continue to transport and/or treat wastewater in the Waccamaw Region in order to ensure their conformance to the Waccamaw Areawide Water Quality Management Plan (WQM). This is a requirement of PL92-500, as defined in 40 CFR Part 130.12(a), dated January 11, 1985.

This review will be conducted on all activities which involve SCDHEC review and approval of Preliminary Engineering Reports, permit requests or plans and specifications for new and reissued NPDES permits; construction permits; sewage treatment facilities; waste load allocations; pump stations; force mains; and outfall lines in the Waccamaw Region.

The flow of paperwork between agencies will occur as shown in the three (3) attached flow-charts for any requests for permits, PERs, or plans and specifications for projects within the Waccamaw 208 planning area. The WRPDC will review these requests in a timely fashion and will certify these requests as to their conformance with the Waccamaw WQM Plan. Any conflict (which is defined as any project which is not addressed by the WQM Plan) will be evaluated by the WRPDC and the WQM Plan will be modified or the plans modified as may be necessary to meet the intent and goals of the WQM Plan. No permits or approvals that are in conflict with the Waccamaw WQM Plan will be issued by SCDHEC.

WRPDC staff will develop a tracking system to effectively check the status of the requests and the WRPDC will endeavor to comment on all projects in a timely manner.

Any projects which are in conflict with the WQM Plan will be addressed by modifying the request or modifying the WQM Plan. WQM Plan modifications will be addressed by public hearings and local government agency reviews. All WQM Plan changes will be approved by the WRPDC Board of Directors and forwarded to the SCDHEC for concurrence and certification to EPA when necessary. The locally affected planning commissions will also be provided with all requests for certification in order to meet the intent of 1976 Code of Laws, 6-7-570. The WRPDC will act as a coordinator for other agencies certifications of permit requests to include but not limited to the South Carolina Coastal Council.

The SCDHEC will provide the WRPDC with Total Maximum Daily Loads (TMDL) for those "priority" segments defined by WRPDC for immediate needs. The other TMDL's will be provided on an "as needed" basis by SCDHEC. The formulas for allocation of the TMDL's will be developed and implemented by the WRPDC and submitted to the SCDHEC for their concurrence. The WRPDC staff will work with SCDHEC and the Designated Management Agencies to develop and implement an ongoing study of the "critical" water quality limited segments in the region to define and refine the water quality data used for allocations.

The WRPDC will revise and update the WQM Plan for the Waccamaw Region annually if necessary. This update will reflect the changes which have occurred over the past year. Population projections, treatment plant flows and locations, major pump station and force main locations, and Management Agency Designation Responsibility updates will be included in this WQM plan update.

This Memorandum of Agreement will be revised and updated as required to meet any changes in regulatory requirements or local needs.

Robert G. Gross, Chief
Bureau of Water Pollution Control

20 June 1985
(Date)

Ken Thompson, Executive Director
Waccamaw Regional Planning and Development Council

6-4-85
(Date)

APPENDIX III

Chapter 1
EXECUTIVE SUMMARY

The Grand Strand Water and Sewer Authority was created through state legislation to provide future protection for surface and groundwaters in unincorporated areas of Horry County, east of the Waccamaw River. The Authority is governed by a Board of Directors currently chaired by Mr. George R. Vereen. The Executive Director for the Authority, Mr. Douglas P. Wendel, manages operation of the Authority which is staffed by over 60 personnel at the present time.

The need for a Plan Update is evidenced by the rapid growth in the Authority's service area. The first plan prepared for the Authority in the early 1970's is now out of date with respect to projected population and flows. Therefore, the Authority commissioned this Wastewater Facilities Plan Update in 1983.

The Planning period for this update extends from the year 1985 through the year 2005. This compares with the original plan, which considered a period extending only through the year 1997.

The service area for the Authority has been officially revised from time to time to meet the changing needs of the entire Grand Strand region. As currently defined, the service area encompasses that portion of Horry County east of the Waccamaw River except for the Myrtle Beach and North Myrtle Beach areas, plus a portion of Garden City Point in Georgetown County. This service area is divided into three service subareas. The South Strand service area is generally that area southeast of the Waccamaw River and the Intracoastal Waterway, south of Highway 501. The Central Strand Service Area is bounded by the Waccamaw River and Conway on the south and west, the Intracoastal Waterway on the south and east, and the Seaboard Coast Line Railroad on the north. The North Strand Service Area extends from this point to the North Carolina state line.

Population projections for the Plan Update are based on the 1980 Census of Population and County land use planning. Permanent population was projected within the state-bounded limits for each of the four CDD's comprising the Authority service area. This projection resulted in a permanent population of 98,680 by the year 2005. Overnight and day visitors are projected from historic growth in the region for each of the four CDD's. This method resulted in a year 2005 projection of 143,980 overnight visitors and 165,200 day visitors.

Wastewater flows for the planning period were developed from the population projections and unit waste flows recommended in the original Environmental Impact Statement. These unit flows included 100 gpcd for permanent residents, 50 gpcd for overnight visitors, and 25 gpcd for day tourists. These determinants resulted in flow projections for each of the three Grand Strand service subareas. By the year 2005, it is estimated that the Authority will be managing a total of 21.3 mgd of wastewater flows.

A water conservation program was initiated by the Grand Strand Water and Sewer Authority in 1983. This is a Countywide program, representing a long-term commitment by the Authority to promote water conservation throughout the Grand Strand region. This will result in reduced wastewater flows, the magnitude of which will not be quantifiable for a few years.

An environmental assessment is presented in the Plan Update addressing climate, topography, geology, sensitive areas, socioeconomics trends, water resources, existing facilities, and potential environmental impacts of plan recommendations. Attention is focused on water resources, both surface and groundwaters, to maximize protection of the Grand Strand's valuable water resources through appropriate wastewater management methods.

Existing wastewater systems in the Authority's service area include the Baytree WWTP (planned to be taken out of service in September), Little River Welcome Center WWTP, and the Interim North Plant A in the North Strand Service Area; the TEC WWTP in the Central Strand Service Area; and the South Strand Regional WWTP (Plant G) in the South Strand service area. These facilities are described in the Plan Update and their future use is carefully considered in the development of recommendations for future wastewater management methods for the Authority.

Wastewater management alternatives were developed considering present and future conditions in the service area. This resulted in the development of the following alternatives for detailed consideration:

South Strand

South Strand 1--Secondary treatment with effluent discharge to the Waccamaw River supplemented with land application in the summer.

South Strand 2--Secondary treatment plus filtration with effluent discharge to an aquifer recharge system.

South Strand 3--Secondary treatment plus filtration with effluent discharge of the Waccamaw River.

Central Strand

Central Strand 1--Secondary treatment with effluent discharge to the Waccamaw River, supplemented with summer irrigation.

Central Strand 2--Secondary treatment with effluent discharge to wetlands.

Central Strand 3--Secondary treatment with effluent discharge to rapid infiltration.

Central Strand 4--Secondary treatment with combined discharges (per above).

North Strand

North Strand 1--Secondary treatment with effluent discharge to Carolina Bays.

An evaluation of treatment methods was conducted to select the most cost-effective means of secondary treatment for each service area. For alternatives requiring advanced secondary treatment, a continuous clean shallow bed gravity filtration system was selected, based on past experiences with various types of filtration systems.

The cost-effectiveness evaluation for the treatment/disposal alternatives considered present worth, process stability and flexibility, ease of operation, safety of operation, energy demand, utilization of existing facilities, environmental impact and innovative/alternative technology classification. Based on these considerations, the following recommendations were developed:

South Strand--Expansion of existing facility to 12.7 mgd using a modified rotating biological contactor (RBC) secondary treatment process. Effluent disposal will be by Waccamaw River discharge per the wasteload allocation, with excess to golf course irrigation and the Authority's sod farm, all in proximity to the facility.

Central Strand--Aerated lagoon secondary treatment process, with ultimate capacity of 4.9 mgd, with effluent disposal by golf course irrigation and onsite land treatment, supplemented by wet-weather discharge to the Waccamaw River.

North Strand--Aerated lagoon secondary treatment process, with ultimate capacity of 3.7 mgd, with discharge to the Carolina Bays (the 201 Amendment already completed and approved for the North Area recommended these facilities, of 2.5- and 1.2-mgd capacities).

Wastewater conveyance systems are also considered in the Plan Update. The necessary interceptors, pump stations, and force mains required to serve the three service areas are located and sized on a preliminary basis to provide for orderly system development. Phasing for these systems is addressed to provide service as appropriate to best match anticipated development.

The solids management system for the Authority's planned facilities is addressed in detail. The present system at the Authority's South Strand Regional WWTP includes a sod farming operation preceded by anaerobic digestion. In light of the Authority's significant investment in this system, the success of the system to date, and the availability of land to readily expand this system, it is recommended that the sod farm operation be expanded to service the future facilities.

Implementation of the 20-year Wastewater Facilities Plan Update is based on present development and local knowledge relating to planned development within the service area. The plan calls for phased construction of the wastewater facilities to satisfy the growing needs of the area as these needs are realized. Based on order-of-magnitude capital costs and operation and maintenance expenses, estimated impact fees and user charges for future years are presented for further consideration.

gnR172/14

APPENDIX IV

SPEES NO	FACILITY NAME	COUNTY	PLANT TYPE	FLOW WLA	ACTUAL FLOW	PRIMARY RECEIVING WATERS	STREAM CLASS	BASIN	SEGMT	SEGMT CLASS
SCCC02879	AIRLADA HESS CORP/GEORGETOWN	GEORGETOWN	IN	.0012		SAMPIT RV	SC	030702	04	W
SCCC34667	AMERICAN CYANAMID COMPANY	GEORGETOWN	IN			SAMPIT RV	SC	030702	04	W
SCCC25135	ANDREWS TOWN OF	GEORGETOWN	MU	2.0	0000550	LESTER CK-	T A	030710	12	W
SCCC39781	BROWNS FERRY SCHOOL	GEORGETOWN	CO			LANES CREEK	A			
SCCC07311	CAROLINA REFINING & DISTRIB	GEORGETOWN	IN		0000350	SAMPIT RV	SC	030702	04	W
SCCC23031	CHOPTEE SCHOOL/GEORGETWN SCH	GEORGETOWN	MU	.01	0000010	CHOPPEE CK DI-BLACK RV	T A	030706	06	W
SCCC39195	DEEP CREEK ELEM SCH/GEORGTWN	GEORGETOWN	MU	0.015		BOSSER SWP-PORT CK-	T B	030724	01	E
SCCC29561	GCW&SA/HAGLEY PLANT	GEORGETOWN	MU	.05		WACCAMAW RV TR	T A	030702	06	E
SCCC28711	GCW&SA/HARMONY HILLS MHP	GEORGETOWN	MU	0.100	0000036	TURKEY CK-SAMPIT RV	TSC	030702	15	W
SCCC22895	GCW&SA/LITCHFIELD PLANT C	GEORGETOWN	MU	2.6	0000200	CHAPELS CK-	T A	030702	02	W
SCCC39691	GCW&SA/LITCHFIELD PLANT C	GEORGETOWN	MU			WACCAMAW RIVER				
SCCC33758	GCW&SA/LITCHFIELD PLANTATION	GEORGETOWN	MU	.02		CHAPEL CK-WACCAMAW RV	T A	030702	02	W
SCCC29805	GCW&SA/WELCOFIELD PLANTATION	GEORGETOWN	MU	.4		BLACK RV	B	030706	03	E
SCCC43029	GEORGETOWN CITY OF	GEORGETOWN	MU			INT'L PAPER CO CANAL				
SCCC35726	GEORGETOWN STAINLESS MFG	GEORGETOWN	IN	0.015		CANAAN BR DI-	TSC	030702	18	W
SCCC01431	GEORGETOWN STEEL CORP	GEORGETOWN	IN	2.04	0000420	SAMPIT RV	SC	030702	04	W
SCCC00671	GEORGETOWN STEEL/FERREDUC PLT	GEORGETOWN	IN	.46		SAMPIT RV	SC	030702	04	W
SCCC21415	GEORGETOWN/MAIN PLANT	GEORGETOWN	MU	3.5	0001600	WHITES CK-SAMPIT RV	TSC	030702	16	E
SCCC32435	GREEN ACRES MHP	GEORGETOWN	MU	.0261	0000001	6 MILE CK-BLACK RV	T B	030706	07	W
SCCC00608	INTERNATIONAL PAPER COMPANY	GEORGETOWN	IN	18.0	0030000	SAMPIT RV	SC	030702	04	W
SCCC01619	M & T CHEMICALS/ANDREWS PLT	GEORGETOWN	IN	.13	0000130	JOHNSONS SWP DI-	B	030710	11	W
SCCC24791	MARTIN MARIETTA/GEORGETOWN QUA	GEORGETOWN	IN	13.82		SANTEE RV	B	030602	20	W
SCCC39926	ONEITA KNITTING MILLS/ANDREWS	GEORGETOWN	IN			LESTERS CK				
SCCC39025	PAWLEYS PIER VILLAGE INC	GEORGETOWN	MU	.018		ATLANTIC OCEAN	SA	030704	01	W
SCCC39101	PLEASANT HILL HS/GEORGETWN SCH	GEORGETOWN	MU	.018		BOSSER SWP DI-PORT CK-	T B	030724	01	E
SCCC39110	SAMPIT ELEM SCH/GEORGETWN SCH	GEORGETOWN	MU	.015		KILSOCK BAY DI-SAMPIT RV	TSC	030702	04	W
SCCC35463	SC HWY DEPT/GEORGETOWN SHOP	GEORGETOWN	IN			PEE DEE RV MSH DI	T B	030702	03	W
SCCC02471	SC PUBLIC SER/WINYAH STEAM STA	GEORGETOWN	IN	.006		TURKEY CK	TSC	030702	15	W
SCCC36111	VVV CORPORATION	GEORGETOWN	IN	.00402		SAMPIT RV	SC	030702	04	W
SCCC30732	WHITE C-LINCLNSHR/CAROLINA WTR	GEORGETOWN	MU	.125		WHITES CK DI-SAMPIT RV	TSC	030702	16	W
SCCC24058	AVX CERAMICS CORP	HORRY	IN	.02	0000020	WITHERS SWASH-	TSA	030704	15	W
SCCC33375	AYNOR LAUNDROMAT	HORRY	IN	.005	0000001	MILL BR DI	T A	030718	07	W
SCCC40207	BAKER BROS MINE	HORRY	IN			JENKINS SWAMP				
SCCC40398	C L LEWTON/MULLET CREEK MINE	HORRY	IN			MULLET CK				
SCCC29530	CEDAR CREEK VILLAGE	HORRY	IN	1.5		INTERCOASTAL WATERWAY	A	030715	05	W
SCCC41733	CONWAY/OXIDATION POND #3	HORRY	MU	1.2	0000250	WADUS LK-WACCAMAW RV	T A	030716	18	W
SCCC40240	G & H CONSTRUCTION & MINING	HORRY	IN							
SCCC03059	GA PACIFIC/CONWAY PLT	HORRY	IN	.0001		WACCAMAW RV DI	A	030716	01	E
SCCC40169	GSW&SA/CAROLBAY PILOT PGM	HORRY	MU			UNNAMED DITCH				
SCCC40410	GSW&SA/CENTRAL RV PLT	HORRY	MU			WACCAMAW RV				
SCCC39500	GSW&SA/CENTRAL WETLANDS PLT	HORRY	MU			WACCAMAW RV WETLANDS				
SCCC26476	GSW&SA/COASTAL CAROLINA TEC	HORRY	MU	1.2	0000175	WACCAMAW RV DI	T A	030716	01	E
SCCC33441	GSW&SA/INTERIM PLT A	HORRY	MU	3.7		INTRACOASTAL WATERWAY	SA	030715	05	W
SCCC37793	GSW&SA/SCHMARTZ PLANT	HORRY	MU	7.5		WACCAMAW RV	ASWP	030702	02	E
SCCC40425	GSW&SA/TEC PILOT PLT	HORRY	MU			WACCAMAW RV-WETLANDS				
SCCC34288	KINGSTON MINING COMPANY	HORRY	IN			JENKINS CK	T A	030718	08	W
SCCC36179	LITTLE RIVER WATER & SEWERAGE	HORRY	IN	.0008		DRAINAGE DITCH		030715	05	W
SCCC35945	LORIS TOWN OF	HORRY	MU	.27		PLEASANT MEADOW SWP	B	030718	10	W
SCCC40763	MASER-BLACK CO/MINE #1	HORRY	IN			BEAR SWAMP				
SCCC29039	MYRTLE BEACH/MAIN PLT-NEW	HORRY	MU	12.0		WACCAMAW RV	ASWP	030716	01	E
SCCC29969	MYRTLE BEACH/WATER PLT	HORRY	IN			INTRACOASTAL WW				

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NPDES NO	FACILITY NAME	COUNTY	PLANT TYPE	FLOW WLA	ACTUAL FLOW	PRIMARY RECEIVING WATERS	STREAM CLASS	BASIN	SEGMT	SEGMT CLASS
SC0022161	N MYRTLE BEACH/CRESCENT BEACH	HORRY	MU	2.1	0000525	INTRACOASTAL WATERWAY	A	030715	05	W
SC0022152	N MYRTLE BEACH/OCEAN DRIVE PLT	HORRY	MU	3.4	0000725	INTRACOASTAL WATERWAY	A	030715	05	W
SC0032450	PINE VALLEY ESTATES	HORRY	MU	.0477		WACCAMAW RV TR	T A	030716	01	E
SC0029289	HUM BLUFF WTP/LTL RIVER WTR	HORRY	MU	.6		WACCAMAW RV	A	030716	02	E
SC0036455	SC HWY DEPT/CONWAY SHOP	HORRY	IN			WACCAMAW RV DI	A	030716	01	E
SC0028444	SC HWY DEPT/WELCOME CTR-LIT RV	HORRY	MU	.0075		MULLET CK	TSA	030715	04	W
SC0001104	SC PUBLIC SLR/GRAINGER STEAM	HORRY	IN	66.3		WACCAMAW RV	A	030716	01	E
SC0033014	SHELLY ACRES SD/GRAHAM CONST	HORRY	MU	.01	0000001	MILL BR-CHINNERS SWP-	T A	030718	07	W
SC0022454	UNITED MERCH & MFG/CONWAY PLT	HORRY	IN	.15		MAPLE SWP	T A	030716	16	W
SC0030317	US AIR FORCE/MYRTLE BEACH AFB	HORRY	MU	.75		INTRACSTL WTWY	A	030715	05	W
SC0039431	W A WEST/FILL DIRT	HORRY	IN			COLLINS CREEK SWAMP	T A	030716	01	E
SC0002780	WOLVERINE BRASS WORKS	HORRY	IN	0.130	0000127	SOCASTEE SWP DI	T A	030715	03	W
SC0040223	AGRIPEN L P	WILLIAMSBURG	IN							
SC0003123	GIST-BROCADES USA	WILLIAMSBURG	IN	2.275	0002275	BROAD SWP TR-	T A	030710	10	W
SC0021695	HEMINGWAY TOWN OF	WILLIAMSBURG	MU	.4		MUDDY CK-	B	030724	04	W
SC0039934	HEMINGWAY TOWN OF	WILLIAMSBURG	MU			CLARKS CREEK				
SC0035971	KINGSTREE/NEW PLANT	WILLIAMSBURG	MU	2.16		BLACK RV	A	030710	01	E
SC0023493	MILLIKEN & CO/KINGSTREE MILL	WILLIAMSBURG	IN	.276		BLACK RV	T A	030710	01	E
SC0036439	SC HWY DEPT/KINGSTREE	WILLIAMSBURG	IN			BLACK RV SWP DI	A	030710	01	E

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